

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

ECE2066 – OPERATING SYSTEMS
(CE)

26 OCTOBER 2018
9:00 A.M. - 11:00 A.M.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This examination paper consists of 5 pages with 4 questions only.
2. Answer **ALL** the 4 questions. The distribution of marks for each question is given.
3. Please print all your answers in the Answer Booklet provided.

Question 1 (25 marks)

(a) Give THREE (3) reasons that contribute to the evolution of an operating system. [6 marks]

(b) Answer the questions below:

- (i) Define **program** and **process** in the context of operating system. [4 marks]
- (ii) Give an example to differentiate between program and process. [3 marks]

(c) Four jobs listed in Table Q1(c) are to be executed on a single processor computer with 4096 MB of memory. The jobs can be carried out either using the uniprogramming or multiprogramming scheme. Assuming that virtual memory is not used in the case of multiprogramming. Compare the jobs implemented in both uniprogramming and multiprogramming in terms of the following:

- (i) Processor usage (%). [4 marks]
- (ii) Memory usage (%). [2 marks]
- (iii) Throughput (number of jobs per hour). [2 marks]
- (iv) Mean response time. [2 marks]
- (v) Disk usage (%). [2 marks]

Table Q1(c): Job descriptions

	JOB 1	JOB 2	JOB 3	JOB 4
Type of job	Heavy I/O	Heavy computation	Light I/O	Heavy I/O
Processor usage	10%	60%	5%	15%
Duration	10 minutes	30 minutes	5 minutes	20 minutes
Memory required	100 MB	500 MB	70 MB	300 MB
Disk usage	Yes	No	No	No

Continued...

Question 2 (25 marks)

(a) Explain the necessary and sufficient conditions for deadlock to occur in a multi-threaded application. [8 marks]

(b) The operating system must allocate and de-allocate various resources for each running process. Give FOUR (4) examples of resources which can be accessed by processes. [4 marks]

(c) Semaphore uses special variables for signalling in order to avoid mutual exclusion. Describe in detail the operations that can be performed on a semaphore. [5 marks]

(d) At an instant, the resource allocation state in a system is given as follows:

4 processes: P1, P2, P3, P4

4 resource types: R1, R2, R3, R4

R1 (5 instances), R2 (3 instances), R3 (3 instances), R4 (3 instances)

Snapshot at time T_0 :

	Allocation			
	R1	R2	R3	R4
P1	0	0	1	0
P2	2	0	0	1
P3	0	1	1	0
P4	1	1	0	0

	Request			
	R1	R2	R3	R4
P1	2	0	0	2
P2	1	3	0	1
P3	2	1	1	0
P4	4	0	3	1

	Available			
	R1	R2	R3	R4
P1	2	1	1	2

Is the system deadlocked? If so, identify the processes that are deadlocked.

[8 marks]

Continued...

Question 3 (25 marks)

(a) CPU scheduling is the basis of multiprogrammed operating systems. Discuss each of the following criteria in the context of CPU scheduling:

- (i) CPU utilization. [2 marks]
- (ii) Throughput. [2 marks]
- (iii) Turnaround time. [2 marks]
- (iv) Response time. [2 marks]

(b) Assuming that four processes (P1, P2, P3, and P4) arrive at time 0 and are ready to be executed. Table Q3(b) shows the burst time of the processes:

Table Q3(b)

Processes	Burst Time (millisecond)
P1	2
P2	5
P3	9
P4	7

- (i) Describe the operation of each of the following scheduling algorithm. Then apply the algorithms for the processes in Table Q3(b). Draw the respective Gantt Chart which shows each process's schedule. Show the working steps.
 - (I) First-Come, First-Served (FCFS). [3 marks]
 - (II) Shortest-Process-Next (SPN). [3 marks]
 - (III) Highest-Response-Ratio-Next (HRRN). [6 marks]
- (ii) Calculate the average waiting time for each of the algorithm in Q3(b)(i). [3 marks]
- (iii) Compare FCFS, SPN, and HRRN scheduling algorithms. [2 marks]

Continued...

Question 4 (25 marks)

(a) (i) Describe sequential and indexed sequential file organization. [4 marks]

(ii) Consider the following scenario:

When accessing a file, all records in the file will be accessed.

Would you recommend sequential or indexed sequential file organization? Explain your answer. [4 marks]

(iii) Discuss FIVE (5) criteria in choosing a file organization system. [5 marks]

(b) Consider a sequential file of 10000 words. Two records of this file, namely, R_1 and R_2 , have to be accessed. On average, how many accesses are required to locate them if the records:

(i) Can lie anywhere in the file? [3 marks]

(ii) Are known to be adjacent records? [3 marks]

(c) Consider the Windows operating system. There are three files named `file.c`, `File.c`, and `FILE.c`, respectively. Can they lie in the same directory? Can they lie in different directories? Justify your answers. [6 marks]

End of paper